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# Tuna Newsletter

**National Marine Fisheries Service**
- **Southwest Region**
- **Southwest Fisheries Science Center**

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25th Anniversary Edition

# U.S. TUNA STATISTICS

*Editor's note: The following articles were prepared by NMFS personnel from data and information gathered from sources in the U.S. tuna industry and government.*

## U.S. CANNED TUNA INDUSTRY HIGHLIGHTS, FOURTH QUARTER 1997

Total receipts of tuna by U.S. canners during the fourth quarter of 1997 (October-December) decreased by 14% to the equivalent of 94,600 short tons (st) of whole fish (round weight), compared to the fourth quarter of 1996 (Table 1). The principal species received was albacore with 36% of the total, followed by skipjack and yellowfin tuna with 34% and 30% of the total, respectively. Albacore receipts held steady while skipjack and yellowfin tuna receipts were down by 32% and 3%, respectively.

Receipts for the entire year of 1997 totaled 410,800 st, down 12% from the previous year (Table 2). Albacore receipts were up by 2%

**Table 1.** Total U.S. cannery receipts (st) by species for the fourth quarters of 1996 and 1997. Totals may not add due to rounding.

| Oct-Dec | Type | Albacore | Skipjack | Yellowfin[1] | TOTAL |
|---|---|---|---|---|---|
| 1996 | ROUND | 30,800 | 31,800 | 17,600 | 80,200 |
| | GILLED & GUTTED | * | * | 100 | 100 |
| | LOIN | 1,300 | 7,100 | 5,000 | 13,400 |
| | TOTAL (as received) | 32,100 | 38,900 | 22,700 | 93,700 |
| | TOTAL (round weight)[2] | 33,700 | 47,700 | 29,000 | 110,400 |
| 1997 | ROUND | 31,500 | 15,700 | 22,100 | 69,300 |
| | GILLED & GUTTED | 0 | 0 | * | * |
| | LOIN | 1,000 | 7,500 | 2,700 | 11,200 |
| | TOTAL (as received) | 32,600 | 23,200 | 24,800 | 80,600 |
| | TOTAL (round weight)[2] | 33,800 | 32,600 | 28,100 | 94,600 |

*Less than 100 st reported for this category.

[1]May include a small amount of bigeye tuna.

[2]Converted to round weight by using factors of 1.11 for gilled-and-gutted and 2.25 for loins.

**Table 2.** Total U.S. cannery receipts (st) by species for 1996 and 1997. Totals may not add due to rounding.

| Jan-Dec | Source | Albacore | Skipjack | Yellowfin[1] | TOTAL |
|---|---|---|---|---|---|
| 1996 | ROUND | 112,000 | 180,300 | 69,400 | 361,700 |
| | GILLED & GUTTED | 100 | * | 1,200 | 1,200 |
| | LOIN | 1,500 | 29,200 | 15,100 | 45,700 |
| | TOTAL (as received) | 113,500 | 209,400 | 85,700 | 408,700 |
| | TOTAL (round weight)[2] | 115,400 | 245,900 | 104,700 | 466,000 |
| 1997 | ROUND | 114,200 | 138,400 | 75,600 | 328,200 |
| | GILLED & GUTTED | * | 0 | 900 | 900 |
| | LOIN | 1,800 | 22,400 | 12,100 | 36,300 |
| | TOTAL (as received) | 116,000 | 160,800 | 88,600 | 365,400 |
| | TOTAL (round weight)[2] | 118,200 | 188,700 | 103,800 | 410,800 |

*Less than 100 st reported for this category.

[1]May include a small amount of bigeye tuna.

[2]Converted to round weight by using factors of 1.11 for gilled-and-gutted and 2.25 for loins.

**Table 3.** U.S. cannery receipts (st) of domestic and imported tuna by species for the fourth quarters of 1996, 1997 and the recent (1992-96) fourth quarter averages. Totals may not add due to rounding.

| Oct-Dec | Source | Albacore | Skipjack | Yellowfin[1] | TOTAL |
|---|---|---|---|---|---|
| | | TOTAL CANNERY RECEIPTS (ALL LOCATIONS) | | | |
| 1996 | DOMESTIC | 8,500 | 21,300 | 9,800 | 39,700 |
| | IMPORTED | 23,600 | 17,500 | 12,900 | 54,000 |
| | TOTAL | 32,100 | 38,900 | 22,700 | 93,700 |
| 1997 | DOMESTIC | 3,600 | 12,700 | 19,700 | 36,000 |
| | IMPORTED | 29,000 | 10,500 | 5,100 | 44,500 |
| | TOTAL | 32,600 | 23,200 | 24,800 | 80,600 |
| 1992-96 Average | DOMESTIC | 4,900 | 35,500 | 11,500 | 51,900 |
| | IMPORTED | 25,700 | 19,000 | 9,800 | 54,500 |
| | TOTAL | 30,600 | 54,500 | 21,300 | 106,400 |

[1]May include a small amount of bigeye tuna.

**Table 4.** U.S. cannery receipts (st) of domestic and imported tuna by species for 1996, 1997 and the recent (1992-96) averages. Totals may not add due to rounding.

| Jan-Dec | Source | Albacore | Skipjack | Yellowfin[1] | TOTAL |
|---|---|---|---|---|---|
| | | TOTAL CANNERY RECEIPTS (ALL LOCATIONS) | | | |
| 1996 | DOMESTIC | 18,400 | 122,600 | 41,300 | 182,300 |
| | IMPORTED | 95,100 | 86,800 | 44,400 | 226,300 |
| | TOTAL | 113,500 | 209,400 | 85,700 | 408,700 |
| 1997 | DOMESTIC | 11,500 | 104,500 | 61,000 | 177,000 |
| | IMPORTED | 104,500 | 56,200 | 27,600 | 188,300 |
| | TOTAL | 116,000 | 160,800 | 88,600 | 365,400 |
| 1992-96 Average | DOMESTIC | 11,100 | 145,800 | 46,700 | 203,500 |
| | IMPORTED | 96,300 | 81,000 | 37,600 | 214,900 |
| | TOTAL | 107,400 | 226,800 | 84,300 | 418,400 |

[1]May include a small amount of bigeye tuna.

while skipjack and yellowfin tuna receipts were down by 23% and 1%, respectively.

Although the vast majority of tuna received by U.S. canners is whole fish, some quantity is received as loins or gilled-and-gutted. Receipts of tuna loins for the fourth quarter of 1997 were down by 16%, while receipts of loins for the entire year were down by 21%. (Loins and gilled-and-gutted receipts are converted to round weight receipts by factors of 2.25 and 1.11, respectively. For this article, unconverted receipts are used unless otherwise stated.)

Domestic and imported deliveries to U.S. canners for the fourth quarter of 1997 decreased by 9% and 18%, respectively (Table 3). Yellowfin tuna was the largest component of all domestic deliveries at 19,700 st. Imports outpaced domestic deliveries by 8,500 st.

For the entire year of 1997, domestic deliveries and imports decreased from the previous year by 3% and 17%, respectively, (Table 4). Imports accounted for 52% of the tuna delivered to U.S. canners.

Albacore was the leading import for the fourth quarter of 1997 at 29,000 st, followed by skipjack and yellowfin tuna at 10,500 st and 5,100 st, respectively (Table 5). The leading supplier was Taiwan, with 61% of the import market, followed by Japan and Honduras with 9% and 6% of the market, respectively.

The western Pacific Ocean was the source of 68% of the tuna received by U.S. canners during the fourth quarter of 1997 (Table 6). The next greatest sources were the eastern Pacific and eastern Atlantic oceans, accounting for 14% and 9% of the tuna received by U.S. canners, respectively.

**Table 5.** U.S. cannery imports (st) of tuna by species and source (flag of catcher vessel) for the fourth quarter of 1997. Totals for the fourth quarter of 1996 are given for comparison. Note that the flag of the catcher vessel does not necessarily reflect the country of export or point of shipment. Totals may not add due to rounding.

| VESSEL FLAG | October-December 1997 | | | | 1996 |
|---|---|---|---|---|---|
| | Albacore | Skipjack | Yellowfin[1] | TOTAL | TOTAL |
| AMERICAN SAMOA | 300 | 0 | * | 300 | * |
| AUSTRALIA | 100 | 0 | 0 | 100 | 0 |
| BELIZE | 800 | * | * | 800 | 900 |
| COOK ISLANDS | 300 | 0 | 0 | 300 | 100 |
| ECUADOR | 100 | 700 | 400 | 1,200 | 4,900 |
| FIJI | 200 | 0 | * | 200 | 200 |
| FRANCE | 100 | * | * | 100 | 3,200 |
| HONDURAS | 2,700 | * | * | 2,700 | 100 |
| JAPAN | 3,900 | 100 | 0 | 4,000 | 1,900 |
| NEW ZEALAND | 100 | 0 | * | 100 | 100 |
| PANAMA | 200 | 0 | * | 200 | 1,400 |
| PHILIPPINES | 0 | 400 | 0 | 400 | 1,300 |
| SOUTH AFRICA | 300 | 0 | 0 | 300 | 500 |
| SOUTH KOREA | 1,100 | 100 | 0 | 1,200 | 2,100 |
| TAIWAN | 17,600 | 6,800 | 2,600 | 27,000 | 19,700 |
| TONGA | 200 | 0 | 0 | 200 | 100 |
| URUGUAY | 100 | 0 | 0 | 100 | * |
| USA | * | 500 | 300 | 800 | 2,000 |
| VANUATU | 0 | 600 | 300 | 900 | 700 |
| VENEZUELA | 0 | 100 | 0 | 100 | 2,000 |
| WESTERN SAMOA | 1,000 | * | * | 1,000 | 800 |
| UNKNOWN | 0 | 1,200 | 1,500 | 2,700 | * |
| OTHER | * | * | 0 | 0 | 12,100 |
| TOTAL | 29,000 | 10,500 | 5,100 | 44,500 | 54,000 |

*Less than 100 st reported for this category.

[1]May include a small amount of bigeye tuna.

**Table 6.** Receipts (st) of tuna by U.S. canneries by species and area of capture for the fourth quarters of 1996 and 1997. Totals may not add due to rounding.

| SOURCE | Albacore | | Skipjack | | Yellowfin[1] | |
|---|---|---|---|---|---|---|
| | 1996 | 1997 | 1996 | 1997 | 1996 | 1997 |
| **E. ATLANTIC OCEAN** | | | | | | |
| DOMESTIC | 0 | 0 | 0 | 0 | 0 | 0 |
| IMPORTED | 9,400 | 7,100 | 2,100 | 0 | 1,600 | 0 |
| TOTAL | 9,400 | 7,100 | 2,100 | 0 | 1,600 | 0 |
| **W. ATLANTIC OCEAN** | | | | | | |
| DOMESTIC | 0 | 0 | 0 | 0 | 0 | 0 |
| IMPORTED | 3,500 | 3,400 | 1,300 | 0 | 900 | 0 |
| TOTAL | 3,500 | 3,400 | 1,300 | 0 | 900 | 0 |
| **E. PACIFIC OCEAN** | | | | | | |
| DOMESTIC | 8,200 | 1,500 | 2,000 | 2,000 | 1,500 | 2,000 |
| IMPORTED | 600 | 100 | 4,400 | 2,600 | 5,100 | 3,000 |
| TOTAL | 8,800 | 1,600 | 6,300 | 4,600 | 6,700 | 4,900 |
| **W. PACIFIC OCEAN** | | | | | | |
| DOMESTIC | 300 | 2,100 | 19,300 | 10,700 | 8,300 | 17,800 |
| IMPORTED | 6,700 | 14,100 | 6,200 | 7,900 | 1,100 | 2,100 |
| TOTAL | 7,000 | 16,300 | 25,600 | 18,700 | 9,400 | 19,900 |
| **INDIAN OCEAN** | | | | | | |
| DOMESTIC | 0 | 0 | 0 | 0 | 0 | 0 |
| IMPORTED | 3,400 | 4,200 | 3,500 | 0 | 4,000 | 0 |
| TOTAL | 3,400 | 4,200 | 3,500 | 0 | 4,000 | 0 |

[1]May include a small amount of bigeye tuna.

# U.S. TUNA FISHERIES UPDATE

## EASTERN PACIFIC TROPICAL TUNA FISHERY

During the period January through June 1998, the U.S. tropical tuna fleet in the eastern Pacific caught an estimated 5,100 metric tons (mt) of yellowfin tuna, 5,600 mt of skipjack tuna and 1,600 mt of bigeye tuna (Figure 1). The yellowfin tuna catch was up less than 1%, the skipjack tuna catch was down 11%, and the bigeye tuna catch was down 16% compared to the same period in 1997.

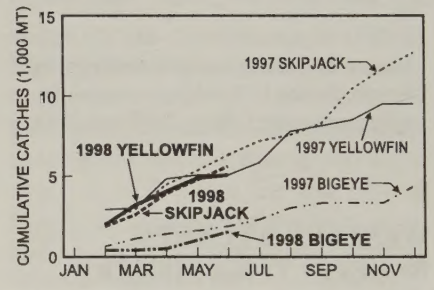


**Figure 1.** Cumulative catches, by month, for the U.S. eastern tropical Pacific tuna fleet, 1997 and 1998. (Note that data are not available for January.)

During this period the surface fleets (purse seiners and baitboats) of all nations fishing in the eastern tropical Pacific Ocean caught an estimated 125,000 mt of yellowfin tuna, 49,900 mt of skipjack tuna and 13,600 mt of bigeye tuna. The leading nation was Mexico with 34% of the total catch, followed by Ecuador with 21% and Venezuela with 18%. The U.S. fleet accounted for 6% of the tuna catch.

## WESTERN PACIFIC TROPICAL TUNA FISHERY

For the period January through June 1998, U.S. tuna purse seiners fishing in the western tropical Pacific landed an estimated 52,800 mt of skipjack tuna and a combined 27,300 mt of yellowfin and bigeye tuna (Figure 2). The skipjack tuna landings were down 6% and the

combined yellowfin and bigeye tuna landings were up 50% from the 1997 landings for the same period. Thirty-five vessels landed tuna from 88 trips for this period of 1998 compared to 33 vessels and 80 trips in 1997. *(Report provided by Doug Prescott, NMFS Southwest Fisheries Science Center, La Jolla, CA)*

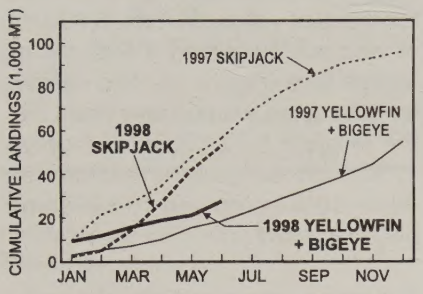


**Figure 2.** Cumulative tuna landings, by month, for the U.S. western tropical Pacific purse seine fishery, 1997 and 1998.

## WESTERN ATLANTIC BLUEFIN TUNA FISHERY

NMFS filed a final specifications/final rule, effective May 15, 1998, to set annual Atlantic bluefin tuna (BFT) quotas and *General* category effort controls. Based on consideration of the comments received, several minor changes were made to the proposed specifications. The New York Bight set-aside will be implemented when it is determined that BFT have migrated to the New York Bight area and when the coastwide *General* category is closed (e.g., in late September). In addition, three additional restricted-fishing days are established in July, and one restricted-fishing day is substituted for another in August.

NMFS will maintain the annual quota allocations (i.e., the baseline 1997 category allocations) until further changes are deemed necessary to achieve domestic management objectives or to implement revised ICCAT quotas. The 1998 initial BFT quotas are as follows: *General* category, 657 metric tons (mt); *Harpoon* category, 53 mt; *Purse Seine* category, 250 mt; *Angling* category, 269 mt; *Incidental* category, 114 mt; and *Reserve*, 52 mt (Table 7).

**Table 7.** 1998 U.S. Atlantic bluefin tuna quotas by category.

| Category | 1995 Base Quotas[b] | Initial 1997 Quotas | Initial 1998 Quotas[c] |
|---|---|---|---|
| **General** | **531** | **633** | **657** |
| **Harpoon** | **53** | **53** | **53** |
| **Incidental** | **110** | **110** | **114** |
| Other | 1 | 1 | 1 |
| Longline | 109 | 109 | 113 |
| North | 23 | 23 | 24 |
| South | 86 | 86 | 89 |
| **Purse Seine** | **250** | **250** | **250** |
| **Angling** | **222** | **265** | **269** |
| School[a] | 100 | 108 | 108 |
| North | 53 | 57 | 57 |
| South | 47 | 51 | 51 |
| Large School/ Small Medium | 119 | 151 | 153 |
| North | - | - | 81 |
| South | - | - | 72 |
| Trophy | 3 | 6 | 8 |
| North | - | 2 | 3 |
| South | - | 4 | 5 |
| **Reserve** | **145** | **33** | **52** |
| **Total** | **1,311** | **1,344** | **1,395** |

[a]ICCAT 1996 recommendation limits the annual school size class subquota to 8% of annual U.S. allocation.
[b]Actual 1995 quotas included adjustments to base due to overharvest/underharvest in 1994.
[c]1998 adjusted quotas include addition of underharvest in 1997.

Restricted-fishing days for 1998, on which persons aboard vessels permitted in the *General* category are prohibited from fishing (including tag-and-release fishing) for BFT of all sizes, are as follows: July 8, 15, 16, 19, 22, 25, and 29; August 1, 5, 9, 11, 12, 13, 16, 19, 23, 26, and 30; and September 2, 6, 9, 13, 16, 19, 20, 23, 27, and 30. On these designated restricted-fishing days, persons aboard vessels permitted in the *Charter/Headboat* category may fish for school, large school and small medium BFT only, provided the *Angling* category remains open, and are subject to the catch limits in effect for the *Angling* category

In other Atlantic bluefin tuna news, pursuant to an order of the U.S. District Court for Massachusetts on June 10, 1998, the prohibition on the use of spotter aircraft to assist fishing vessels in the location and capture of Atlantic bluefin tuna, with the exception of *Harpoon* and *Purse Seine* category vessels, is void. Therefore, effective immediately, spotter aircraft may now assist vessels in all categories. *(Report provided by Pat Scida, NMFS Northeast Region, Gloucester, MA)*

# REPORTS

*Editor's note: Original reports are published as a service to subscribers and may not represent the views of the NMFS. Readers should contact the authors of reports for details, if needed.*

# NORTH PACIFIC ALBACORE CATCHES AND DECADAL-SCALE CLIMATIC SHIFTS

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## Introduction

An overall, steady decline in catches of surface-caught albacore tuna occurred from the mid 1970s through the 1980s in the North Pacific. A climate shift also occurred during this same time period and may have been a basic cause for that downturn in the fishery: the albacore catch decline and the climate shift were both marked and sustained, the catch decline was in phase with the environmental change, and it occurred in a period of generally declining, rather than increasing, albacore-directed fishing effort.

The climate shift began in 1976 and is accepted by climatologists as having been a major event that lasted at least into the late 1980s. It was a decadal-scale change, one of several of such fluctuations that can be seen in meteorological records, including a previous one during 1923-1947. We examined these data to see if the shifts could be related to the long-term changes in albacore catches.

## Long-Term Fluctuations

Fisheries, 1929-1951. Albacore were caught for industrial use (canning) as early as 1903 off Southern California. This was the first tuna species canned, and it dominated the "pack" from canneries through 1925. But albacore virtually disappeared from Southern California waters between 1926 and 1937. The time trend of these catches appeared to reflect albacore abundance (as indexed by catch per unit effort), or at least their availability over large areas.

The Japanese fishery grew quickly after 1925 to supply U.S. demand resulting from the 1926-1937 albacore failure off California. But Japanese fishermen also experienced a marked decline in catches during the 1930s. Their catch rates during 1929-1936 also suggest that total albacore catch was proportional to stock size or availability. Unfortunately, the war years interrupted this fishery and data from it. This fishery resumed in 1947.

Fisheries, 1952-1993. Data on the U.S. and Japanese surface albacore catch have been more reliable since 1952. Japanese pole-and-line fishing operations quickly spread eastward to about 160° E longitude and to beyond the dateline by the early 1970s, following the migrating albacore eastward. Thereafter, fishing effort decreased due to a restructuring of their fishing fleet. Meanwhile, the U.S. troll fishery, which had been largely a coastal operation, gradually extended westward. During the 1980s there was a surge of westward expansion, bringing some trollers to the vicinity of the Emperor Seamounts. Thus the surface albacore fishery had become ocean-wide, targeting the juvenile fish along their entire spring-summer, trans-Pacific migratory route. In both fisheries, catches increased erratically (especially for Japan) approximately until the mid-1970s and then declined strongly.

Catch-per-unit-effort abundance indexes indicate that surface albacore abundance had declined, erratically but steadily, since at least the mid-1970s, paralleling the similar decline in catches. This abundance decline is seen in both the U.S. and Japanese fisheries, indicating an ocean-wide decline in the population during this period.

Climatology. The environmental data for comparing with the fishery records are sea surface temperatures (SSTs) and sea level atmospheric pressures (SLPs) from Scripps Institution of Oceanography. SST is tabulated on a 5-degree latitude-longitude grid and extended from 1880 to 1994 over a near-global domain. Similar SLP data, reflecting near-surface winds, extended from 1951-1993. In addition, a longer period (1899-1995) central North Pacific SLP index, representing the area 35° N - 55° N and 170° E - 150° W, was used.

Indexes of environmental trend, which are averages over selected areas, were developed for comparing with the albacore catches. An SST index was the temperature average for the central-western North Pacific; it tracks the average annual, upper-water-column thermal conditions where juvenile albacore are migrating eastward in spring and summer. A SLP index for the central North Pacific was the average pressure over the area from October through March; it represents atmospheric circulation during the central North Pacific winter, i.e., the intensity of the Aleutian Low pressure system that affects much of North Pacific climatology.

## Correlations

We used catch rather than catch-per-unit-effort data (the latter generally indexes population abundance) to compare against the environmental data, because the effort data were incomplete and imprecise. This was especially so in the 1929-1951 phase of the fishery, when fishing was largely coastal. As noted, long-term trends in catch itself seemed to reflect long-term trends in abundance, or at least regional availability of the population.

To examine the multi-year fluctuations in fish catch and associated environmental variables, filters of El Niño Southern Oscillation (ENSO) frequency (band-passed at $(2\ yr)^{-1}$ and $(7\ yr)^{-1}$ frequency cutoffs) and decadal frequency (low passed be-

low (7 yr)$^{-1}$ frequency) were employed. The filtered data were examined as anomalies relative to their means; it allowed us to examine the fish-environment data to determine if there were consistent linkages across ENSO and decadal time scales. The environmental data were compared with the fishery data both as averaged indexes and as global, gridded data in spatial correlation analyses. Here we present only analyses of the U.S. data. The Japanese fishery had a relatively late beginning (1931) and was interrupted during WWII.

**Environmental Indexes and Catches**

SSTs and Catches. In Figure 3 both annual U.S. catches and the regional SST index for the central-western North Pacific are compared as anomalies. The anomalously low catches in the 1920s and 1930s match, as negative anomalies, the anomalously low temperatures then (temperature anomalies are in hundredths of a Celsius degree). Though the representativeness then of the fishery to the entire population is problematical, the striking California catch failure of that period does suggest that something more than the coastal fishery was affecting the population. And the rise of both catch and temperature anomalies during the 1940s, 1950s, and 1960s suggests a particular environmental effect: long-term warming or warm regimes produces fishery build-ups.

ENSO-scale fluctuations, in the form of anomalies filtered from both the catch and the SST index, occur largely in phase (Figure 4). Thus good fishing years of 2-7 year periodicity tend to be warm years in the central-western North Pacific, the same relationship as seen in the decadal-length signals.

SLPs and Catches. Decadal-scale pressure anomalies of the winter SLP index from the central North Pacific were not as striking, chang-

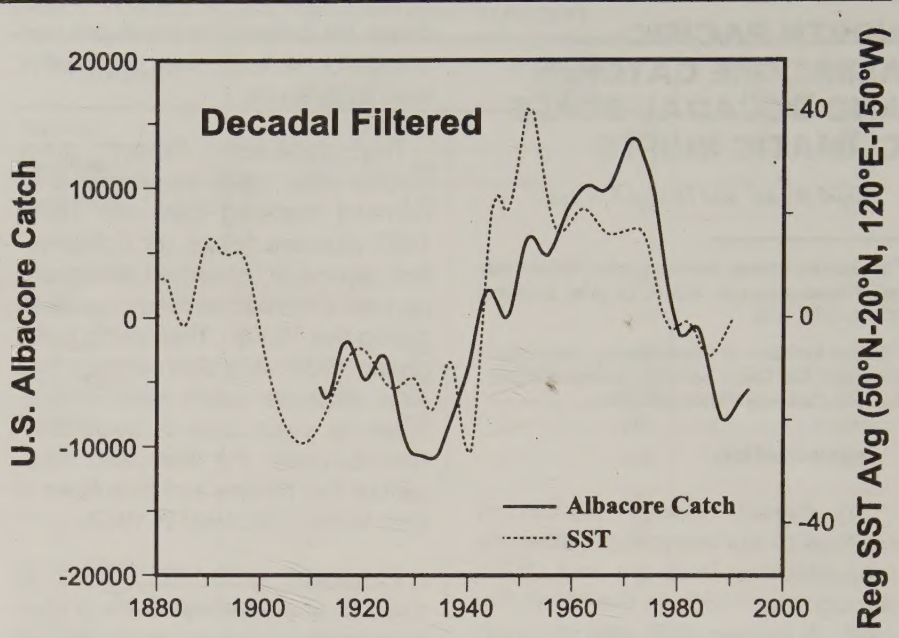


**Figure 3.** Decadal-filtered U.S. albacore catch and central-western North Pacific, regional SSTs as anomalies relative to their means.

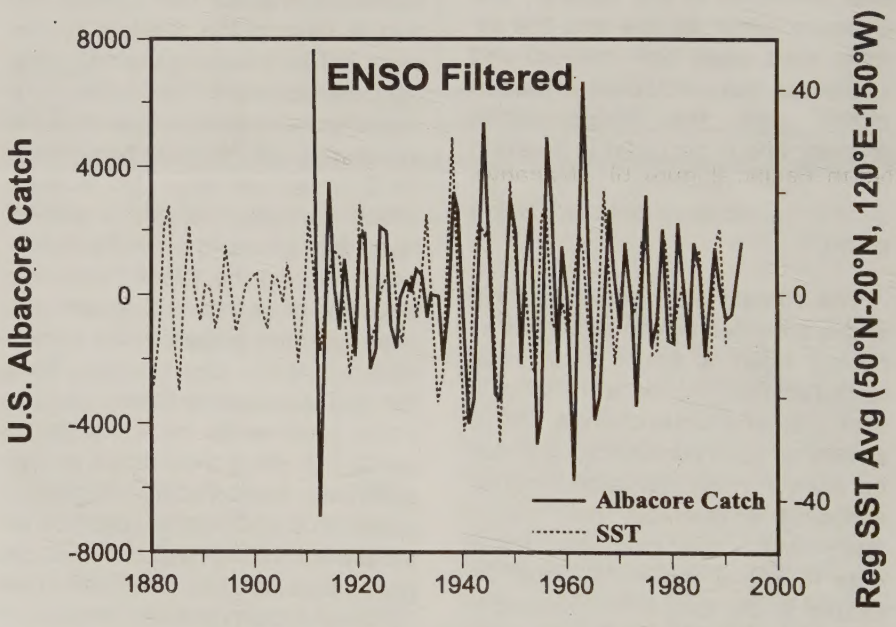


**Figure 4.** ENSO-filtered U.S. albacore catch and central-western North Pacific, regional SSTs as anomalies relative to their means.

wise, as that for SST, but like the latter, also tended to follow the long-term catch anomalies (not shown). The positive and negative anomalies of both catch and SLP were largely in phase, just as was the case for the decadal-filtered SST. Thus the albacore build-up occurred during a period of anomalously high winter SLPs, which are winters that are relatively mild.

The ENSO-scale SLP anomalies for the central North Pacific winter tended to correlate positively with the ENSO-filtered catches, as well, although the phase match was again less striking than for the SST data (not shown). Thus ENSO-length periodicities of anomalously high and low winter SLPs over the central North Pacific tended to be associated with similar periodicities

of better and poorer than average albacore catches, respectively, just as was seen in the decadal-length signals.

### Spatial Correlations

When the time series of SST and SLP anomalies for each 5-degree square are compared with the 1911-1991 albacore catch history, strongly coherent, spatial patterns in correlation are seen. These correlations connect decadal-filtered catches to decadal-filtered SSTs and SLPs, and also connect the ENSO-filtered versions of each variable, although not as coherently for the latter.

SSTs and Catches. The spatial distribution and degree of correlation between decadal-filtered catches and global SSTs show positive coefficients of 0.5 or better coherently and notably centered over the central and western, temperate North Pacific (Figure 5). Negative correlated areas are coherently grouped in the eastern North Pacific. Other coherent groupings of positive and negatively correlations are found in areas unconnected with the North Pacific fishery, such as in the South Pacific and in the Atlantic, a result of environmental conditions that are "teleconnected" to the North Pacific and hence also correlated with albacore catches there.

SLPs and Catches. The decadal SLP signal is also coherently correlated with albacore catch (Figure 6), but the 0.5 or better positive coefficients are displaced further northward over subarctic waters. Note, however, that it is at the periphery of coherent areas of positive correlation where strong SLP gradients and anomalous, easterly geostrophic winds are to be expected–winds that would counter or weaken the normal winter winds there. The effect of the more northerly SLP pattern is therefore consistent with the regions of high SST correlations.

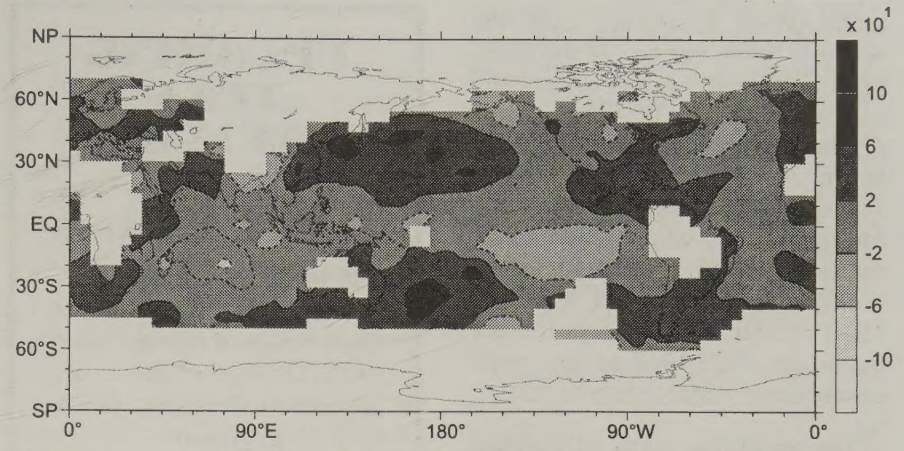


**Figure 5.** Spatial pattern of correlation coefficients between decadal-scale albacore catch and global SSTs. (Darkest and next darkest contours are for coefficients of 0.6 and 0.2, respectively.)

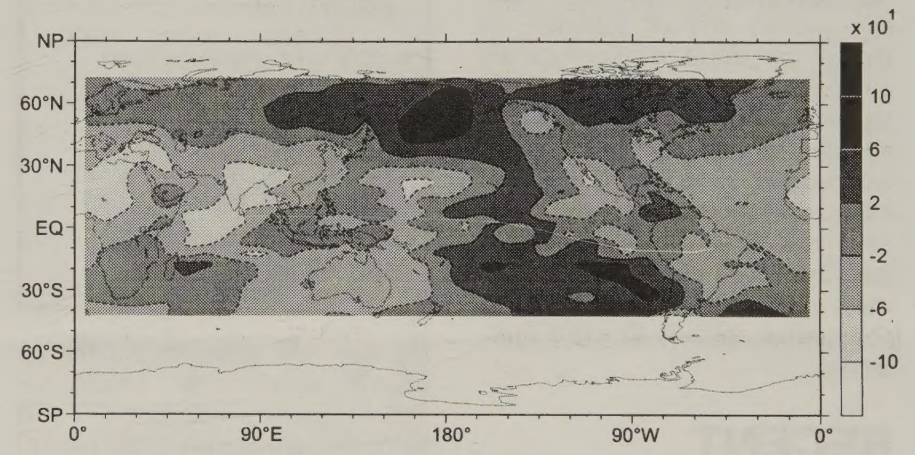


**Figure 6.** Spatial pattern of correlation coefficients between decadal-scale albacore catch and global sea level pressures (SLPs). (Contours as in Figure 5.)

### Discussion

The spatial patterns of positive catch-environment correlation, especially at decadal scales, are seen to be coherently located in those areas where juvenile albacore should be affected, i.e., the central-western North Pacific. This is evidence for the effects of real phenomena. It is this same large-scale and coherent, geographic pattern to environmental changes in the North Pacific that makes the evidence for long-term, large-scale climatic shifts there most convincing to climatologists. It supports our view that ocean-atmosphere shifts were largely responsible for the down-turn in both the U.S. and Japanese albacore fisheries since the mid-1970s and a similar down-turn in the same fisheries in the 1920s and 1930s (although Japanese catches were more sketchily documented, and both fisheries were largely coastal then).

We do not propose a mechanism for how climate shifts affect albacore; the actual behaviors of this tuna are little known. However, we note that the correlation of better (or poorer) catches with warmer (or colder) SSTs and higher (or lower) SLPs is consistent with a major feature of the climatic shifts as noted by climatologists: differential intensity or deepness of the Aleutian Low pressure system. In winters with deeper Aleutian Lows, SLP is lower in the central north Pacific, and SSTs in the central-western North Pacific are reduced by cooling from surface mixing and heat loss from the intensified cyclonic circulation sweeping

arctic winds southward over the western North Pacific. At the same time in the east, warmer waters and warmer, more moist air are swept northward along the west coast of North America into the Gulf of Alaska. ENSO events will often strengthen this winter cyclonic circulation. Such intensified winter conditions, as occurred after the 1976 climate shift, and previously during the 1926-1947 period, seem somehow inimicable to albacore.

The matching cycle of catches with climatic shifts in the North Pacific is seen in two other fisheries with long-term records, that of Alaskan salmon and of sardines, although the phase relationships are opposite to that of albacore. Spectral analysis of the climatic shifts affecting salmon show an important bidecadal 20-25 year signal for more intense Aleutian Lows in the 1923-1947 and again in the 1978-1989 (approximately) periods. These demark very nearly the same periods of apparent shifts in albacore abundance.

# RECENT DEVELOPMENTS IN TUNA FISHERIES

*Editor's note: The following news items, compiled from fishery trade and industry journals, newspapers and NMFS reports, are provided only as a service to our readers. The NMFS does not guarantee their accuracy.*

## UNITED STATES

**Reporting Requirements for Atlantic Bluefin Tuna Landings**: The NMFS is reminding U.S. Atlantic bluefin tuna fishing vessel operators fishing under the *Angling* category quota to report their recreational bluefin tuna catch by calling a toll-free telephone reporting system within 24 hours of ending their fishing trip. The automated catch reporting system, at 1-888-USA-TUNA, gathers information that helps the agency assess the pace of the fishing effort and reduce the chance that anglers might overfish the quota.

In addition to the toll-free telephone reporting system, NMFS continues to operate the Large Pelagic Survey to collect weekly and seasonal landing and effort information about the recreational bluefin tuna fishery. Vessel operators are reminded that they are required to provide catch and effort information in this survey through dockside interviews and telephone surveys. Dockside survey interviewers also collect biological samples of bluefin tuna, which are passed to scientists working to address some of the biological questions regarding this commercially and recreationally important fish.

A one-page fact sheet describing the reporting process is available by fax to reporters who call (301) 713-2370 to request a copy. Brochures further describing these regulations as well as waterproof reporting reminder cards are available from the Highly Migratory Species Management Division at (301) 713-2347. (NOAA News Release)

**Canned Tuna Campaign**: Bumble Bee Seafoods, the U.S. manufacturer of solid white tuna, is launching its first national brand marketing campaign in 11 years this spring. The $8 million campaign will highlight the San Diego-based company's improved flagship albacore tuna product, and will include advertising, new product packaging and promotions The campaign comes at a critical time for the tuna industry. Tuna consumers now shop primarily based on price, rather than on brand. However, the firm believes that a technological breakthrough in its packing process has given it an improved product, which will be a focal point of he marketing campaign. (GLOBEFISH *Highlights*, June 15, 1998)

## WESTERN PACIFIC

**Major Tuna Fishing Company Expands**: According to the Forum Fisheries Agency, a wholly-owned local company called Sokimona Fishing Pty Ltd has plans to secure a $600 million financial package to build 20 tuna purse seiners, a loining plant, canneries (one locally and another in Europe) and wharf, as well as the necessary infrastructure. The purse seiners, which will be equipped with on-board processing facilities, will have a fishing capacity of 180,000-230,000 mt of tuna a year. Sokimona has reportedly established an office in Athens, Greece, to help expedite the project. (INFOFISH *Trade News*, June 1, 1998)

## EASTERN PACIFIC

**Nabbed Tuna Ship Fishes On**: Perú's fisheries ministry has authorized the company Teknofish SA to

## UPCOMING TUNA MEETINGS

(Organizer; meeting type: sci=science, adm=administration)

- SEP 14-23. International Commission for the Conservation of Atlantic Tunas (ICCAT), Bluefin Tuna Assessment Workshop. Genoa, Italy. (ICCAT; sci)
- OCT 12-19. ICCAT/SCRS meetings. Madrid, Spain. (ICCAT; sci)
- NOV 9-14. Seventh Expert Consultation on Indian Ocean Tunas. Seychelles. (Indian Ocean Tuna Commission; sci)
- NOV 16-24. ICCAT Annual Meeting. Santiago, Spain. (ICCAT; adm)

operate the U.S.-flag tuna seiner, *Connie Jean*, in Peru's coastal waters after confiscating her catch. The *Connie Jean* arrived off Peru's north coast more than a month ago following a school of tuna, but without a fishing permit, and so she had her catch taken. Peru has authorized foreign tuna boats to operate within its 200-mile limit for limited periods on payment of a six-month fishing permit at $75 per registered net ton. The ship can now operate through to October 31 and up to 10 miles from shore. She can also catch mahimahi and shark but must land to Peruvian fish processing plants. Two Ecuadorean tuna ships caught fishing without licences at the same time as *Connie Jean* have also applied for fishing permits. Six local canning and freeing plants have signed agreements with the fisheries ministry to receive the tuna for processing. (*Fishing News International*, June 1998)

## EASTERN ATLANTIC and MEDITERRANEAN

**Request for EU Drift Net Ban Delay**: The proposed ban by the European Union on drift net fishing continues to draw protests from several nations. France and Ireland are pushing for a delay in the implementation of the ban from January 1, 2001, to the year 2004. France has about 40 vessels using drift nets, which places it in second place to Italy's fleet, and Ireland has 10. The ban will affect high seas drift net operations which target tuna and swordfish species. Meanwhile, Greenpeace is reported to have evidence that Italian vessels are continuing to use drift nets in the Mediterranean despite a $300 million conversion program. (INFOFISH Trade News, July 1, 1998)

**Tuna Agreement Signed**: The European Commission and Gabon have signed a three-year agreement allowing EU vessels access to tuna fishing in the country's waters. A total of 75 vessels will be allowed to catch up to 9,000 mt of tuna in return for Gabon receiving $2.3 million a year. Some 60% of the EU payment will be used for research and training. Vessel owners also have to pay $28 per mt for their catch but will not be allowed to fish within 12 miles of the coast of Gabon. (INFOFISH Trade News, June 15, 1998)

**Faeroe Island Permits for Japanese Longliners**: Faeroe authorities have granted three Japanese longliners permits to fish for Atlantic bluefin tuna in their waters in summer 1998. The Japanese vessels will fish together with four Faeroes vessels. Icelandic authorities have yet to decide if permits will be given. Japanese vessels caught 370 mt of bluefin tuna valued at $11.4 million in Icelandic waters in 1997. An Icelandic autoliner is currently being converted for tuna fishing at a Polish shipyard. (GLOBEFISH *Highlights*, June 15, 1998)

## INDIAN OCEAN

**Southern Bluefin Tuna**: On July 8, 1998, Japanese officials announced a unilateral decision that Japan would begin an experimental 65-vessel fishery for southern bluefin tuna in the Indian Ocean from July 10 through August 31, with an expected catch of 1,400 metric tons. New Zealand and Australian officials condemned this Japanese fishery and official protests were filed. Australia continues to ban Japanese longline tuna vessels from Australian ports. On July 9, 1998, New Zealand officials announced that they would consider closing New Zealand ports to Japanese tuna vessels. (Dow Jones News, Reuters)

**Indian Ocean Fisheries Conference**: A conference on fisheries of the Indian Ocean will be held in Fremantle, Western Australia, September 28-30, 1999. Through a series of individual presentations and panel discussions, the conference will address the following aspects of Indian Ocean fisheries: history and heritage; current production, management and marketing; and the prospects for regional cooperation and the development of regional policies. For further details contact conference chairman Dr. Malcolm Tull, Department of Economics, Murdoch University, Murdoch WA 6150, Australia; Ph: 08 9360 24981; Fax: 08 9310 7725; E-mail: tull@central.murdoch.edu.au.

**Omanis Open Tuna Cannery**: A new tuna cannery, owned by Oman-Saudi Foodstuffs Canning Co., was opened in Oman in late February. Annual production is projected to be 13,400 tons, virtually all of which will go for export to Japan, Africa, Australia and Europe. The factory was built at a cost of $9.1 million, and annual sales are expected to reach around $25.2 million. (*World Fishing*, May 1998)

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